REMARKS

Reconsideration and allowance of this application are respectfully requested. Claims 18, 37-70 and 74-76 are cancelled. Claims 1-17, 19-36, and 71-73 remain in this application and, as amended herein, are submitted for the Examiner's reconsideration.

In the Office Action, the Examiner objected to claim 29. The claim has been amended to correct the informality.

Claims 4 and 30 were rejected under 35 U.S.C. § 112, second paragraph. Claims 4 and 30 have been amended to correct the informalities. It is therefore submitted that claims 4 and 30 are in full compliance with the requirements of 35 U.S.C. § 112, second paragraph.

Turning now to the art rejections, claims 1-2 and 4-14 were rejected under 35 U.S.C. § 103 as being unpatentable over Nakamura (U.S. Patent Application Publication No. US 2003/0010993 A1) in view of Parikh (International Publication No. WO 03/026021 A2). Applicants submit that the claims are patentably distinguishable over the cited references.

The Nakamura publication shows, in Fig. 1, an LED structure in which a GaN buffer layer is formed atop a sapphire substrate, and a thick undoped nitride is formed on the buffer layer. A superlattice is then formed by alternately laminating 20 angstrom thick layers of undoped GaN with 20 angstrom thick layers of doped to form a 1 micron thick structure. (See also ¶¶ [0036]-[0044] and [0054]). As acknowledged by the Examiner, Nakamura does not disclose a doping concentration of at most 2E16 cm^{-3}.

The Parikh publication describes a Schottky diode having a 0.5 to 1 micron thick n- layer formed atop a 0.1 to 1.5 microns thick n+ layer that is, in turn, disposed on top of a substrate. The n- layer has a doping concentration in the range

of 5E14 to 5E17 cm^{-3}. (See Fig. 1; pg. 8, ln. 24 to pg. 9, ln. 4; and pg. 21, lns. 9-11).

The Examiner contends that it would have been obvious "to adjust *the modulation doped layer concentration* as taught by Parikh in the process of Nakamura in order to form a high quality film with improved crystallinity" (emphasis added). Parikh, however, is not concerned with *a modulation doped layer*. Rather, Parikh discloses a doping concentration range for *a continuously doped layer*. A person of ordinary skill in the relevant art would not look to a reference that describes the doping concentration range of *a continuously doped layer* for a teaching of the doping concentration of *a modulation doped layer*. The ordinary practitioner would not be able to determine the doped and undoped sub-layer thicknesses of a modulation doped layer from such a reference. Moreover, the ordinary practitioner would not be able to determine the doping concentration of the doped sub-layer of the modulation doped layer from such a reference. In fact, the ordinary practitioner would not be able to determine from such a reference whether sub-layer thicknesses and doped sub-layer doping concentrations are possible that would attain the desired doping concentration of a modulation doped layer.

Additionally, the ordinary practitioner would not look to a reference describing a *continuously doped layer* to teach the doping concentration range of a *modulation doped layer* because the properties that result from a device formed with a continuously doped layer often differ from the properties of a device formed with a modulation doped layer. As an example, though Parikh describes that a Schottky diode formed using the disclosed doping concentration range for a continuously doped layer results in a device having a particular forward voltage drop (V_f) range, the ordinary practitioner would not know from

Parikh that a Schottky diode having a modulation doped layer of this concentration range would likewise attain such a V_f range.

It follows that the ordinary practitioner would not look to Parikh's description of a continuously doped layer to modify Nakamura's process that forms a modulation doped layer.

The Examiner also contends that "parameters such as concentration in the art of semiconductor manufacturing process (*sic*) subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication". However, neither Nakamura nor Parikh provides any indication as to which parameters, such as the thicknesses of the doped and undoped sub-layers or the doping concentration of the doped sub-layer, are critical for attaining a modulation doped layer having a doping concentration of at most 2E16 cm^{-3}. Moreover, neither Nakamura nor Parikh provides any direction as to the values of these parameters that are likely to attain this doping concentration. Therefore, the Examiner's assertion that amounts an "obvious to try" or an "obvious to experiment" assertion which the Federal Circuit has held is not the proper standard for obviousness. (*In re Dow Chemical Co.*, 837 F2d. 469, 5 USPQ2d 1529 (Fed. Cir. 1987); *In re O'Farrell*, 853 F.2d 894, 7 USPQ2d 1673 (Fed. Cir. 1988); *Ecolochem, Inc. v. Southern California Edison Co.*, 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); and *In re Roemer*, 258 F.3d 1303, 59 USPQ2d 1537 (Fed. Cir. 2001)).

Therefore, neither Nakamura nor Parikh discloses or suggests:

> forming a modulation doped layer atop at least a portion of another layer by forming at least one sub-layer of doped nitride semiconductor and at least one sub-layer of undoped nitride semiconductor atop the at least portion of said another layer whereby said modulation doped layer has a doping concentration of at most 2E16 cm^{-3}

as called for in claim 1.

Accordingly, neither Nakamura nor Parikh, whether taken alone or in combination, discloses or suggests the method defined in claim 1, and claim 1 is therefore patentably distinct and unobvious over the cited references.

Claims 2 and 4-14 depend from claim 1. Therefore, each of claims 2 and 4-14 is patentably distinguishable over the cited art for at least the same reasons.

The Examiner also rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Nakamura and Parikh in view of D'Evelyn (U.S. Patent Application Publication No. US 2002/0155634 A1). It is submitted, however, that claim 3 is patentably distinguishable over the cited references.

Claim 3 depends from claim 1 and for at least the same reasons is distinguishable over Nakamura and Parikh.

The D'Evelyn publication is concerned the formation of photodetectors having a PiN structure or a Schottky barrier structure. D'Evelyn, however, does not disclose or suggest a doping concentration for a modulation doped layer and therefore does not remedy the deficiencies of Nakamura and Parikh.

Claims 15 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura and Parikh in view of Lee (U.S. Patent Application Publication No. US 2001/0034116 A1). However, it is submitted that the claims are patentably distinguishable over the cited art.

Claims 15 and 16 depend from claim 1 and are therefore distinguishable over Nakamura and Parikh for at least the same reasons.

The Lee publication shows, in Fig. 8, a Schottky diode in which a continuously doped GaN layer is disposed atop a substrate and then another continuously doped GaN forms a projection atop the first layer. Lee therefore does not disclose or suggest a modulation doped layer having a doping

concentration of at most 2E16 cm^{-3} and therefore does not remedy the deficiencies of Nakamura and Parikh.

The Examiner also rejected claims 17 and 19-35 as being unpatentable over D'Evelyn in view of Parikh. Applicants submit that the claims are patentably distinguishable over the cited references.

The D'Evelyn publication describes a photodetector having a Schottky barrier structure that includes one or more n-doped layers that are disposed between an insulating GaN substrate and an overlying insulating layer. (See Fig. 4; and ¶¶ [0013]-[0014] and [0051]-[0052]). The D'Evelyn publication therefore describes a device structure having *only one undoped GaN layer*. D'Evelyn does not disclose or suggest *alternating sub-layers* of doped nitride semiconductor and undoped nitride semiconductor.

The Examiner contends that Parikh teaches a breakdown voltage field of 2E6 V/cm for a GaN based device. However, as described above, Parikh is concerned with a device having *a continuously doped layer* and thus cannot be relied on as a teaching for a device having a modulation doped layer.

Therefore, neither D'Evelyn nor Parikh discloses a ratio of an on-resistance to a breakdown voltage of a Schottky diode having a modulation doped layer.

The Examiner also asserts that "parameters such as a ratio of on-resistance to breakdown voltage in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication". However, as described above, neither D'Evelyn nor Parikh provides any indication as to which parameters of a modulation doped layer are critical for obtaining the claimed ratio of on-resistance to breakdown voltage, and neither D'Evelyn nor Parikh gives any direction as to which of the many possible values for such parameters are

likely to be successful. Therefore, the Examiner's assertion amounts to an "obvious to try" or an "obvious to experiment" argument which is not the proper standard for obviousness.

Therefore, neither D'Evelyn nor Parikh discloses or suggests:

> forming a modulation doped layer atop at least a portion of another layer by forming alternating sub-layers of doped nitride semiconductor and undoped nitride semiconductor atop the at least portion of said another layer

as recited in claim 17, and neither D'Evelyn nor Parikh discloses or suggests:

> whereby a ratio of an on-resistance of said Schottky diode to a breakdown voltage of said Schottky diode is at most $2x10^{-5}$ $\Omega \cdot cm^2/V$

as set out in claim 17.

It follows that neither D'Evelyn nor Parikh, whether taken alone or in combination, discloses or suggests the method of forming a Schottky diode defined in claim 17. Therefore, claim 17 is patentably distinct and unobvious over the cited references.

Claims 19-35 depend from claim 17. For at least the same reasons, claims 19-35 are patentably distinguishable over the cited art.

The Examiner rejected claims 18 and 71-73 under 35 U.S.C. § 103(a) as being unpatentable over D'Evelyn and Parikh in view of Nakamura. Claim 18 is cancelled. It is submitted that the remaining claims are patentably distinguishable over the cited references.

As acknowledged by the Examiner, neither Nakamura nor D'Evelyn discloses a ratio of on-resistance to breakdown voltage of a Schottky diode having a layer formed of alternating sub-layers of n-type doped nitride semiconductor and undoped nitride semiconductor. The Examiner therefore relies on Parikh

for teaching this ratio in the manner described above. However, for the same reasons described above regarding claims 1 and 17, Parikh cannot be relied on for providing such a teaching.

Further, the Examiner argues that "parameters such as concentration and ratio of on-resistance to breakdown voltage in the art of semiconductor manufacturing are subject to routine experimentation and optimization to achieve the desired characteristics during fabrication." As described above regarding claims 1 and 17, the Examiner's assertion is based on an improper standard for obviousness.

Therefore, neither D'Evelyn, Parikh nor Nakamura discloses or suggests:

> whereby a ratio of an on-resistance of said Schottky diode to a breakdown voltage of said Schottky diode is at most $2x10^{-5}$ $\Omega \cdot cm^2/V$

as defined in claim 71.

Thus, neither D'Evelyn, Parikh nor Nakamura, whether taken alone or in combination, discloses or suggests the method defined in claim 71, and claim 71 is therefore patentably distinct and unobvious over the cited references.

Claims 72-73 depend from claim 71. For at least the same reasons, claim 72-73 are patentably distinguishable over the cited art.

Finally, the Examiner rejected claim 36 as being unpatentable over D'Evelyn and Parikh in view of Sheu (U.S. Patent No. 6,712,478). It is submitted that the claim is patentably distinguishable over the cited references.

Claim 36 depends from claim 17. Therefore, claim 17 is distinguishable over D'Evelyn and Parikh for at least the same reasons.

The Sheu patent describes a light emitting diode in which a Ti/Al/Pt/Au layer forms an ohmic contact with a nitride-based buffer layer. (See Fig. 3; and Col. 3, ln. 59 to Col. 4,

ln. 26). Therefore, Sheu does not remedy the deficiencies of D'Evelyn and Parikh.

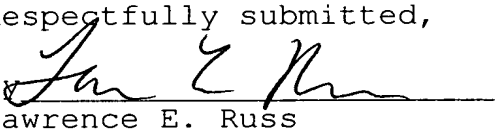
Accordingly, the withdrawal of the rejections under 35 U.S.C. § 103(a) are respectfully requested.

As it is believed that all of the rejections set forth in the Official Action have been fully met, favorable reconsideration and allowance are earnestly solicited. If, however, for any reason the Examiner does not believe that such action can be taken at this time, it is respectfully requested that the Examiner telephone applicant's attorney at (908) 654-5000 in order to overcome any additional objections which the Examiner might have.

If there are any additional charges in connection with this requested amendment, the Examiner is authorized to charge Deposit Account No. 12-1095 therefor.

Dated: January 31, 2006

Respectfully submitted,

By 

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